

## REMARKS

After entry of this amendment, claims 1–24 and 26–77 will be pending. Claim 25 has been canceled, claims 1, 31, 32, 38–39, 43, 46, 48–50, 66, 72, and 76 have been amended, and new claim 77 has been added. Support for the amendments and new claim may be found, for example, in the originally filed claims, as well as in the specification on page 8, lines 14–21; page 11, lines 28–29, page 12, line 21 – page 14, line 26, and page 16, lines 3–4. No new matter has been added.

### Telephone conference with Examiner

The undersigned attorney thanks the Examiner for a telephonic interview that took place on September 29, 2005. The undersigned attorney is appreciative of the opportunity to summarize the proposed claim amendments and the scope of the cited art. The Examiner's suggestions for further characterization of the particulate material are reflected in the foregoing claim amendments. More particularly, independent claims 1, 39, 50, 66, and 72 have been amended to recite a particulate material suitable for use in three dimensional printing, and that an article formed by this process includes a reaction product of the particulate material and an aqueous fluid.

### Rejections Under 35 U.S.C. § 112

Claims 43, 46, 48–49, and 76 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. These claims have been amended in response to the examiner's objections to correct grammatical errors.

Applicants submit that amended claims 43, 46, 48–49, and 76 are now definite.

Rejection of claims under 35 U.S.C. § 102

Claims 1–4, 7, 23, 30, and 37 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,649,277 to Greul et al. (“Greul”).

Greul appears to disclose a binder that may be a wax or polymer for use in free-form manufacture of three dimensional objects. *See* column 4, line 42. The binder of Greul is mixed with a powder; the mixture is melted, discharged from a nozzle, and cooled to define a three dimensional object. *See* column 3, line 64 – column 4, line 42. The powder may include, e.g., copper powder. Greul does not teach or suggest a particulate material comprising plaster and a particulate adhesive material, as recited in amended claim 1.

Applicants submit that for at least these reasons, amended independent claim 1 and claims dependent therefrom are patentable over the cited art.

Claims 1–4, 7, 19, 21–22, and 37 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,660,621 to Brecht (“Brecht ‘621”).

Brecht ‘621 appears to disclose a binder composition that is a fluid. *See* column 2, lines 45–47. Brecht ‘621 does not teach or suggest a particulate material comprising plaster and a particulate adhesive material, as recited in amended independent claim 1.

Applicants submit that for at least these reasons, amended independent claim 1 and claims dependent therefrom are patentable over the cited art.

Claims 1–5, 7–16, 20, 23–25, 30, 33–37, 39–40, 44–49, 66–67, and 72–75 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,738,921 to Andersen et al. (“Andersen”).

Andersen appears to disclose polymeric or starch-containing mixtures for forming containers by molding, reforming, or extruding such compositions. *See* abstract. The mixtures are made by first forming a gel or suspension by mixing together a binder and water. Then, fibrous materials and fillers are added to the gel or suspension. *See* column 37, lines 30–41. Andersen does not teach or suggest a particulate material including plaster and a particulate

adhesive material, as recited in amended independent claims 1, 39, 66, and 72. The mixtures of Andersen are not dry and, therefore, are unsuitable for use in three dimensional printing, as also required by these claims, which employs layers of dry particulate material.

Applicants submit that for at least these reasons, amended independent claims 1, 39, 66, and 72 and claims dependent therefrom are patentable over the cited art.

Claims 1–4, 7, 9, 11–13, 23–25, 30, and 37 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,965,776 to Leppard et al. (“Leppard”).

Leppard appears to disclose various alkoxyphenyl-substituted bisacylphosphone oxides that may, e.g., be used in stereolithography. *See* abstract; column 19, line 50, column 24, line 61, and column 25, line 17. Stereolithography is a method of forming objects from a liquid photopolymer that is selectively hardened by a laser. Leppard does not teach or suggest a particulate material including plaster and particulate adhesive material, as recited in amended independent claim 1. The materials of Leppard are aqueous dispersions and other fluids that are unsuitable for use in the formation, by three dimensional printing, of articles comprised of a plurality of layers that include a reaction product of a particulate material and a fluid, as also required by claim 1.

Applicants submit that for at least these reasons, amended independent claim 1 and claims dependent therefrom are patentable over the cited art.

Claims 1–5, 7, 23–24, 26, 29–30, 33–35, 37, and 39 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,591,563 to Suzuki et al. (“Suzuki”).

Suzuki appears to disclose photocurable resins that may be used for stereolithography. Suzuki does not teach or suggest a particulate material including plaster and particulate adhesive material, as recited in amended independent claims 1 and 39. The materials disclosed by Suzuki are not dry and, therefore, are unsuitable for use in the formation, by three dimensional printing, of articles comprised of a plurality of layers that include a reaction product of a particulate material and a fluid, as also required by claim 1 and 39. Moreover, there is no disclosure that the resins disclosed by Suzuki are soluble, as recited in claim 39.

Applicants submit that, for at least these reasons, amended independent claims 1 and 39 and claims dependent therefrom are patentable over the cited art.

Rejection of Claims Under 35 U.S.C. § 103

Dependent claims 68–71 are rejected as being unpatentable over Andersen in view of U.S. Patent No. 4,310,996 to Mulvey (“Mulvey”). Dependent claims 68–71 depend from independent claim 66.

The Office action states that Andersen does not teach an accelerator and relies on Mulvey to provide this feature. Mulvey appears to disclose a method for forming a gypsum foam that includes adding water and various materials individually to a slurry mixer. *See* Figure 1 and related text. Neither Andersen nor Mulvey, alone or in combination, teaches or suggests a particulate material including plaster and particulate adhesive, as recited in claim 66. The gels or suspensions of Andersen and the slurry mixture of Mulvey are not dry particulate mixtures and, therefore, are unsuitable for use in three dimensional printing, as also required by amended claim 66.

Applicants submit that for at least these reasons, claim 66 and claims dependent therefrom, including 68–71, are patentable over the cited art.

Claims 50–65 are rejected as being unpatentable over Andersen in view of Mulvey.

The Office action states that Andersen does not teach (i) an accelerator/retarder and (ii) a three dimensional printing composition. The examiner relies on Mulvey to teach (i) an accelerator, and argues that (ii) the term “three dimensional printing composition” is recited in the preamble and does not limit the claimed invention. Applicants note that neither Andersen nor Mulvey, alone or in combination, teaches or suggests a particulate material including plaster and particulate adhesives, as recited in amended independent claim 50. Moreover, the gels or suspensions of Andersen and the slurry mixture of Mulvey are not dry and, therefore, are unsuitable for use in three dimensional printing to form an article comprised of a plurality of layers, as also required by amended claim 50.

Applicants submit that for at least these reasons, claim 50 and claims dependent therefrom are patentable over the cited art.

Independent claim 38 is rejected as being unpatentable over Greul, Bredt '621, or Suzuki.

None of these references, alone or in combination, teaches a particulate material including plaster and a particulate adhesive, as recited in amended independent claim 38. Moreover, neither Greul nor Suzuki teaches or suggests a method of three dimensional printing that includes delivering a fluid to a particulate material layer, as also recited in claim 38. As noted above, Greul appears to form three dimensional objects by melting a powder or a powder-binder mixture, dispensing the molten material, and cooling it to define an object. Suzuki appears to disclose photocurable resins that may be used for sterolithography.

Applicants submit that for at least these reasons, amended claim 38 is patentable over the cited art.

Claims 1–8, 12–13, 15, 17, 23, 26–30, 33, 37–39, and 41 are rejected over U.S. Patent No. 5,518,680 to Cima et al. ("Cima '680").

Cima '680 appears to disclose techniques for making medical devices for implantation and growth of cells from polymers or polymer/inorganic composites, including by three dimensional printing. *See* abstract. The Office action states that Cima '680 is silent regarding the amount of binder that is utilized. The examiner appears to consider the liquid binder of Cima '680 to be equivalent to the adhesive material recited in independent claims 1, 38, and 39. Cima '680, however, does not teach or suggest a particulate material including plaster and a particulate adhesive material, as recited in amended claims 1, 38, and 39. Further, the adhesive disclosed in Cima '680 is present in a liquid binder, not in the particulate material recited in claims 1, 38, and 39.

Applicants submit that for at least these reasons, amended claims 1, 38, and 39 are patentable over the cited art.

Dependent claims 18–19 and 21 are rejected over Cima ‘680 in view of U.S. Patent No. 5,387,380 to Cima et al. (“Cima ‘380”). Cima ‘380 appears to disclose adding an acid, such as citric acid, to a powder to promote gelation of an applied binder. The Office action states that Cima ‘680 does not teach an adhesive or filler that is organic acid and relies on Cima ‘380 to provide this feature. Neither of the cited references, alone or in combination, teaches or suggests a particulate material including plaster and a particulate adhesive material, as recited in amended independent claim 1, from which claims 18–19 and 21 depend.

Applicants submit that for at least this reason, claims 18–19 and 21 are patentable over the cited art.

Dependent claims 42–43 are rejected as being obvious in view of Cima ‘680 in combination with U.S. Patent No. 5,851,465 to Brecht (“Brecht ‘465”).

Brecht ‘465 appears to disclose binder compositions for three dimensional printing. *See* abstract. The binder compositions may include a humectant. *See* column 4, lines 48–53. The examiner considers this humectant to be equivalent to the printing aid recited in claims 42 and 43. The binder composition of Brecht ‘465, however, is a liquid, not a particulate material as recited in claims 42 and 43. Moreover, neither Cima ‘680 nor Brecht ‘465, alone or in combination, teaches or suggests a particulate material comprising plaster and a particulate adhesive, as recited in amended independent claim 39, on which claims 42 and 43 depend.

Applicants submit that for at least these reasons, claims 42–43 are patentable over the cited art.

Claims 1–7, 9, 11–13, 22–24, 30, 37, and 39 are rejected as being obvious in view of U.S. Patent No. 5,204,055 to Sachs et al. (“Sachs”).

Sachs appears to disclose a three dimensional printing method in which a binder is printed onto a powder bed. Typical powder materials may include alumina, silica, silicon carbide, zirconia, zircon, metal, ceramic, or plastic. *See* column 8, lines 50–56, column 7, lines 18–21 and column 9, lines 21–23. The examiner appears to equate the droplet size of the binder disclosed by Sachs to the mean particle size recited in independent claim 39. The binder of Sachs, however, is a liquid, not particulate material as recited in independent claims 1, 38, and

39. Further, Sachs does not teach or suggest a particulate material comprising plaster and a particulate adhesive material, as recited in amended claims 1, 38, and 39.

Applicants submit that for at least these reasons, amended claims 1, 38, and 39 are patentable over the cited art.

Dependent claims 42–43 are rejected as being obvious in view of Sachs in combination with Bredt '465.

Bredt '465 appears to disclose binder compositions for three dimensional printing. *See* abstract. The binder compositions may include a humectant. *See* column 4, lines 48–53. The examiner considers this humectant to be equivalent to the printing aid recited in claim 42 and 43. The binder composition of Bredt '465, however, is a liquid, not a particulate material as recited in claim 39, on which claims 42 and 43 depend. Further, neither Sachs nor Bredt '465, alone or in combination, teaches or suggests a particulate material comprising plaster, as recited in amended independent claim 39, on which claims 42 and 43 depend.

Applicants submit that for at least these reasons, claims 42–43 are patentable over the cited art.

## CONCLUSION

In light of the foregoing, Applicants respectfully submit that all claims are now in condition for allowance.


If the Examiner believes that a telephone conversation with Applicants' attorney would expedite allowance of this application, the Examiner is cordially invited to call the undersigned attorney at (617) 570-1806.

A check for \$400 for the extra claim fee is enclosed. Applicants believe that no additional fee is due for filing of this amendment. However, if any additional fee is due, please charge any such fee occasioned by this paper to our Deposit Account No. 07-1700.

Respectfully submitted,

Date: Sept 29, 2005  
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